DTU Library

Electrochemically driven ATRP applied for direct surface grafting of PEDOT

Daugaard, Anders Egede; Hoffmann, Christian

Publication date:
2013

Document Version
Publisher's PDF, also known as Version of record

Electrochemically driven ATRP applied for direct surface grafting of PEDOT

Anders Egede Daugaard[1], Christian Hoffmann[1].
[1] Danish Polymer Centre, Department of Chemical and Biochemical Engineering, Technical University of Demark, Denmark

Functional polymer surfaces are needed for application of polymers in many different products. Especially where the polymer will come into contact with biological material it is a well established problem, that unspecific adsorption will occur to a high degree. In particular, for development of novel sensors the control over surface properties is a major focus area in order to target which types of (bio)molecules that are able to adhere onto a specific surface. In recent years, numerous examples of the application of conductive polymers for sensors have been produced. However, control of the non-specific bonding remains an issue in many of these systems.

Through exploitation of an azide functional poly(3,4-ethylenedioxythiophene) (PEDOT) the presented work focuses on development of novel possibilities for surface grafting on PEDOT through controlled radical polymerization. Introduction of an atom transfer radical polymerization (ATRP) initiator through copper catalyzed cycloaddition of an alkyne and the azide (CuAAC) functional polymer either through conventional(*1*) or electrochemically driven cycloadditions(*2*) facilitates surface grafting through conventional ATRP or e-ATRP. In the presented work grafting directly from the conductive polymer surface allows for exploitation of the embedded conductivity for surface grafting, which was recently illustrated on a self assembled monolayer (SAM) on gold(3). By application of a very simple setup it is possible to control the grafting from the surface, and prepare thin coatings from different monomers such as poly(ethyleneglycol) methacrylate (PEGMA), sulfobetaine methacrylate (SBMA) and sodium tetrafluorostyrenesulfonate (TFSSNa). The method is evaluated through IR, XPS, fluorescence intensity spectroscopy and UV-Vis spectroscopy.

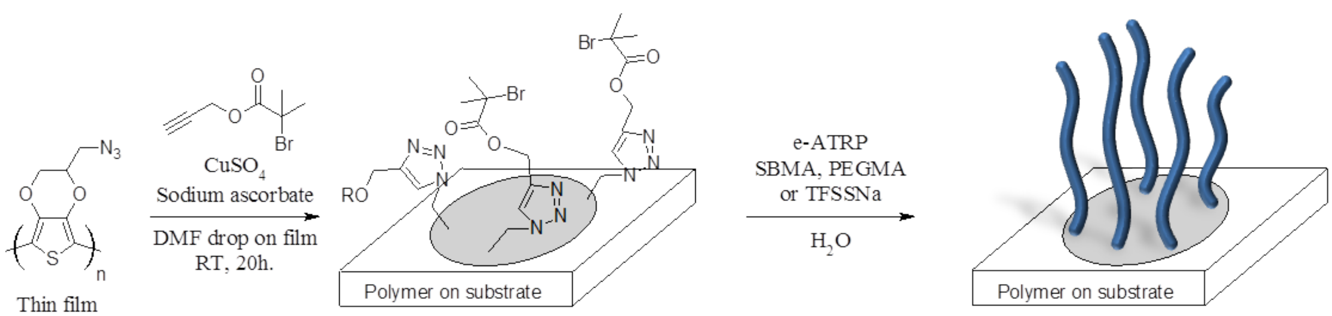

Figure 1. (e-)ATRP applied for surface grafting of a conductive polymer film based on PEDOT.

References:

(1) Daugaard, A. E.; Hansen, T. S.; Larsen, N. B.; Hvilsted, S. *Macromolecules*. **2008**, *41*, 4321–4327.
(2) Hansen, T. S.; Daugaard, A. E.; Hvilsted, S.; Larsen, N. B. *Advanced Materials*. **2009**, *21*, 4483–4486.
(3) Li, B.; Yu, B.; Huck, W. T. S.; Zhou, F.; Liu, W. *Angewandte Chemie (International ed. in English)*. **2012**, *51*, 5092–5.